IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant	:	Fred P. Reinhard	
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APPEAL BRIEF

Dear Sir:

Appellant submits, the following Appeal Brief pursuant to 37 C.F.R. § 41.37 for consideration by the Board of Patent Appeals and Interferences. Please charge any additional fees or credit any overpayment to our deposit Account No.02-2666.

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest is the assignee, Exergy Technologies Corporation.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to Appellant, Appellant's legal representative, or assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-21 of the present application are pending. Claims 1-21 are rejected under 35 U.S.C. §103(a). Appellant hereby appeals the rejections of claims 1-21.

IV. STATUS OF AMENDMENTS

On March 20, 2009, Appellant filed a response to an Office Action dated October 28, 2009. The Examiner issued a Final Office Action on June 25, 2009. On September 25, 2009, Appellant filed a Notice of Appeal and Pre-Appeal Request for Review. The Panel issued a notice to proceed to Board of Patent Appeals and Interferences. No amendments have been filed subsequent to the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

1. Independent claims 1, 13, and 17:

Independent claim 1 recites: A process system (Figure 1; item 10; page 6, lines 15-17) comprising:

an impurity separation subsystem (Figure 1; item 20; page 6, line 15 to page 8, line 8) to remove a selected impurity from a feed water (Figure 1; item 30; page 7, lines 5-14) and to produce a reject solution with an elevated level of the selected impurity (Figure 1; item 60; page 7, lines 16-18) and an output solution (Figure 1; item 40; page 7, lines 14-15), the output solution being the feed water having a substantially reduced level of the impurity (Figure 1; item 40; page 7, lines 14-15); and

an electrolytic membrane separation (EMS) subsystem (Figures 1-2; item 100; page 6, lines 15-17; page 8, line 10 to page 9, line 3) in fluid communications with the impurity separation subsystem, the EMS subsystem to receive the reject solution from the impurity separation subsystem (Figure 1; page 7, line 19 to page 8, line 8) and an electrically conductive solution (Figure 2; item 90; page 8, line 22 to page 9, line 3), to transfer the selected impurity to the conductive solution (page 8, line 22 to page 9, line 1).

Independent claim 13 recites: An electrolytic membrane separation (EMS) subsystem (Figures 1-2; item 100; page 6, lines 15-17; page 8, line 10 to page 9, line 3) comprising:

a first cell frame (Figure 3; item 200; page 10, lines 10-13) comprises an anolyte compartment (Figure 3; item 202; page 10, lines 10-13) to house an anode (Figure 3; item 260; page 10, lines 10-13), the anolyte compartment comprises a first in-flow port (Figure 3; item 204; page 10, lines 13-18) and a first out-flow port positioned above said first in-flow port (page 10, lines 18-23);

a second cell frame (Figure 3; item 210; page 11, lines 9-13) having a catholyte compartment (Figure 3; item 212; page 11, lines 9-13) to house a cathode (Figure 3; item 400; page 11, lines 9-13), the catholyte compartment comprises a second in-flow port (Figure 3; item 214; page 11, lines 14-20) and a second out-flow port positioned above said second in-flow port (Figure 3; item 216; page 11, lines 20 to page 12, line 2); and

at least one membrane (Figure 3; item 220; page 9, lines 5-13) positioned between the anolyte compartment and the catholyte compartment,

wherein the EMS subsystem is adapted to (i) receive a brine solution (Figure 1, item 50; page 7, lines 19-22), used to regenerate an ion exchange resin and having an elevated level of at least one type of impurity (Figure 1; page 7, line 19 to page 8, line 3), into one compartment of the anolyte and catholyte compartments (Figure 9, page 19, lines 1-21), (ii) receive a conductive solution having a volume substantially less than a volume of the brine solution into a different compartment than the compartment supplied with the brine solution (Figure 9, page 19, lines 9-13), (iii) remove the at least one type of impurity from the brine solution (Figure 9, page 19, lines 2-6 and lines 19-21), and (iv) produce a resultant brine solution that may be reused for regeneration of an ion exchange resin (Figure 9, page 19, line 22 to page 20, line 10).

Independent claim 17 recites: A method comprising:

providing an electrolytic membrane separation (EMS) subsystem (Figures 1-2; item 100; page 6, lines 15-17; page 8, line 10 to page 9, line 3) that comprises a plurality of compartments (Figure 3; item 202; page 10, lines 10-13; item 212; page 11, lines 9-13) each including an electrode being one or an anode (Figure 3; item 260; page 10, lines 10-13) and a cathode (Figure 3; item 400; page 11, lines 9-13);

supplying a brine solution having a first volume and an increased level of an impurity to a first compartment of the plurality of compartments (Figure 9, page 19, lines 1-21);

supplying a conductive solution to a second compartment of the plurality of compartments, the conductive solution having a second volume substantially less than the first volume (Figure 9, page 19, lines 9-13);

energizing the electrodes to cause ions associated with the impurity to migrate from the brine solution to the second compartment (Figure 9, page 19, lines 14-22); and

outputting the conductive solution having the impurity as waste (Figure 9, page 20, lines 7-14).

2. Dependent claims 2-12, 14-16, and 18-21:

Dependent claim 2 recites: The process system of claim 1, wherein the EMS subsystem further increases concentration of the reject solution for reuse (Figure 1, page 6, line 13-16).

Dependent claim 3 recites: The process system of claim 2, wherein the impurity separation system is an ion exchange unit that comprises ion exchange resin that filter the selected impurity from the feed water (Figure 1, page 6, line 18 to page 7, line 4).

Dependent claim 4 recites: The process system of claim 3, wherein the reject solution is a brine solution used to regenerate the ion exchange resin (Figure 1, page 7, line 19 to page 8, line 3).

Dependent claim 5 recites: The process system of claim 2, wherein the reject solution is a diluted brine regenerate solution that achieves an increased concentration through off-gasing (Figure 9, page 19, line 22 to page 20, line 6).

Dependent claim 6 recites: The process system of claim 1, wherein the EMS subsystem further produces a diluate after removal of the selected impurity from the reject

solution and outputs the diluate to a flow including the output solution (Figures 1-2; page 8, lines 10-21).

Dependent claim 7 recites: The process system of claim 1, wherein the EMS subsystem comprises

a first cell frame (Figure 3; item 200; page 10, lines 10-13) comprises an anolyte compartment (Figure 3; item 202; page 10, lines 10-13) to house an anode (Figure 3; item 260; page 10, lines 10-13), the anolyte compartment comprises a first in-flow port (Figure 3; item 204; page 10, lines 13-18) and a first out-flow port (page 10, lines 18-23);

a second cell frame (Figure 3; item 210; page 11, lines 9-13) having a catholyte compartment (Figure 3; item 212; page 11, lines 9-13) to house a cathode (Figure 3; item 400; page 11, lines 9-13), the catholyte compartment comprises a second in-flow port (Figure 3; item 214; page 11, lines 14-20) and a second out-flow port (Figure 3; item 216; page 11, lines 20 to page 12, line 2); and

a membrane positioned between the anolyte compartment and the catholyte compartment (Figure 3; item 220; page 9, lines 5-13).

Dependent claim 8 recites: The process system of claim 7, wherein the conductive solution is supplied to the anolyte compartment of the EMS subsystem through the first in-flow port and the reject solution is supplied to the catholyte compartment of the EMS subsystem through the second in-flow port (Figure 9; page 19, lines 1-13).

Dependent claim 2 recites: The process system of claim 8, wherein the reject solution is a brine solution used to regenerate an ion exchange resin (Figure 1, page 7, line 19 to page 8, line 3).

Dependent claim 10 recites: The process system of claim 9, wherein the EMS subsystem produces a reusable brine solution after transfer of the selected impurity to the conductive solution for output from the second out-flow port and outputs the conductive solution with the selected impurities via the first out-flow port as waste (Figure 9, page 20, lines 7-14).

Dependent claim 11 recites: The process system of claim 7, wherein the conductive solution, being negatively conductive, is supplied to the catholyte compartment of the EMS subsystem through the second in-flow port and the reject solution is supplied to the anolyte

compartment of the EMS subsystem through the first in-flow port (Figure 10, page 21, lines 6-16).

<u>Dependent claim 12</u> recites: The process system of claim 1 further comprising:

a pre-filtration system in fluid communications with the impurity separation system where the feed water is a filtrate being a filtered feed water (Figure 13, item 1110, page 24, lines 12-20).

<u>Dependent claim 14</u> recites: The EMS subsystem of claim 13 further producing a waste solution including the conductive solution having at least one type of impurity (figure 1-2, page 8, line 22 to page 9, line 3).

<u>Dependent claim 15</u> recites: The EMS subsystem of claim 13, wherein the catholyte compartment to receive the brine solution and the anolyte compartment to receive the conductive solution (Figure 9, page 19, lines 1-13).

<u>Dependent claim 16</u> recites: The method of claim 13, wherein the anolyte compartment to receive the brine solution and the catholyte compartment to receive the conductive solution being negatively charged (Figure 10, page 21, lines 6-16).

<u>Dependent claim 18</u> recites: The method of claim 17 further comprising:

outputting a resultant brine solution for reuse in regenerating ion exchange resins (Figure 1, page 7, line 19 to page 8, line 3).

<u>Dependent claim 19</u> recites: The method of claim 18 further comprising:

off-gasing the brine solution as the impurity has been removed to produce the resultant brine solution (Figure 9, page 19, line 22 to page 20, line 6).

<u>Dependent claim 20</u> recites: The method of claim 17, wherein the impurity comprises one of a monovalent ion and a heavy metal (Figure 1, page 7, lines 7-18).

<u>Dependent claim 21</u> recites: The method of claim 17, wherein the impurity comprises one of a monovalent ion and a heavy metal (Figure 1, page 7, lines 7-18).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Claims 1-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Byszewski (U.S. Patent No. 5,352,345).

B. Claims 13-16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Byszewski (U.S. Patent No. 5,352,345).

C. Claims 17-21 are rejected under 35 U.S.C. §103(a) as being unpatentable over Byszewski in view of Boateng (U.S. Patent No. 5,225,054).

D. The outstanding rejection is improper in accordance with MPEP §706 and 37 C.F.R. §1.104(c)(2).

VII. ARGUMENTS

In the Final Office Action, the Examiner rejected claims 1-16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Byszewski (U.S. Patent No. 5,352,345) and claims 17-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Byszewski in view of Boateng (U.S. Patent Number 5,225,054). Appellant respectfully traverses the rejection and submits that the Examiner has not met the burden of establishing a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, certain basic criteria must be met. For instance, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. MPEP §2143. Appellant respectfully submits that the combined teachings do not address each and every limitation, and thus no *prima facie* case of obviousness has been established.

Furthermore, the Supreme Court in Graham v. John Deere, 383 U.S. 1, 148 USPQ 459 (1966), stated: "Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined." MPEP 2141. In KSR International Co. vs. Teleflex, Inc., 127 S.Ct. 1727 (2007) (Kennedy, J.), the Court explained that "[o]ften, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order *to determine whether there was*

an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *Emphasis Added.* The Court further required that an explicit analysis for this reason must be made. "[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." KSR, 127 S.Ct. at 1741, quoting In re Kahn, 441 F.3d 977, 988 (Fed. Cir. 2006).

In the instant case, Appellant respectfully submits that the combined teachings of the cited prior art references do not teach or suggest all of the claim limitations. Furthermore, Appellant respectfully submits that there are significant differences between the cited references and the claimed invention and thus, there is no apparent reason to combine the known elements in the manner as claimed. No *prima facie* case of obviousness has been established.

A. Claims 1-12 Are Not Obvious under 35 U.S.C. §103(a) over Byszewski

Claims 1-12

Byszewski fails to disclose: (1) an impurity separation subsystem to remove a selected impurity from a feed water and to produce a reject solution with an elevated level of the selected impurity and an output solution, the output solution being the feed water having a substantially reduced level of the impurity; and (2) an electrolytic membrane separation (EMS) subsystem in fluid communications with the impurity separation subsystem, the EMS subsystem to receive the reject solution from the impurity separation subsystem and an electrically conductive solution, to transfer the selected impurity to the conductive solution, as recited in amended claim 1.

The Examiner alleges that the ion exchanger corresponds to the impurity separation subsystem and the electrodialytic water splitter 428 corresponds to the EMS (Office Action dated 01/11/2009, page 3, as referenced in present Final Office Action, page 2). Appellant respectfully disagrees.

a) The base depleted regenerant 422 is pretreated to remove impurities such that it cannot correspond to "a reject solution with an elevated level of the selected impurity"

As shown in Figure 5, Byszewski merely discloses fresh anion exchange regenerant being introduced via line 400 into an exhausted anion exchange column, 401. The exhausted regenerant is removed via line 402 and the suspended solids are filtered out via filtration unit, 403, and removed from the system via line 404. The filtered, exhausted anion exchange regenerant is fed into the base purification unit, 409, via line 408. An aqueous solution,

preferably water or a base solution, is fed into the base purification compartment, 409, via line 407. The recovered base is withdrawn form the base purification unit via line 410. The base depleted exhausted regenerant is removed from the base purification unit via line 412. A portion of the base depleted exhausted regenerant in line 412 is fed to a pH adjustment unit, 418. Makeup concentrated salt, and HCl/NaOH are optionally added to the pH adjustment unit via lines 416, and 417, respectively to maintain a pH of about 5 to about 6 so that the SiO_2 and Al_20_3 will precipitate. Following pH adjustment in unit 418, the residual regenerant stream travels via line 419 to filtration unit, 420. Insoluble silicates are removed from the system via line 421. The base depleted regenerant is withdrawn from the silicate removal unit and fed into the salt compartment of the electrodialytic water splitter, 428, via line 422 (Byszewski, col. 7, lines 20-62; Figure 5).

Accordingly, as illustrated in Figure 5, the base depleted regenerant 422 which is received by the electrodialytic water splitter 428, allegedly the EMS, is pretreated to remove impurities (Byszewski, col. 6, lines 8-10). More specifically, the suspended solids are filtered out via filtration unit 403, and removed from the system via line 404 and insoluble silicates are filtered out via the filtration unit 420 and removed from the system via line 421. Accordingly, the electrodialytic water splitter 428 receives a base depleted regenerant 422 which already has impurities removed.

In contrast, claim 1 recites: "an impurity separation subsystem to remove a selected impurity from a feed water and to produce a reject solution with an elevated level of the selected impurity and an output solution… the EMS subsystem to receive the reject solution from the impurity separation subsystem…"

Assuming that the ion exchanger is the system in Figure 5 connected to the input of the electrodialytic water splitter 428, the ion exchanger produces a base depleted regenerant 422 which is received by the electrodialytic water splitter 428.

Thus, given that the base depleted regenerant 422 already has impurities removed, the base depleted regenerant 422 cannot be a reject solution with an elevated level of the selected impurity. Accordingly, the ion exchanger does not constitute the impurity separation subsystem as claimed because the ion exchanger fails to produce a reject solution with an elevated level of the selected impurity. Furthermore, the electrodialytic water splitter 428 does not constitute the electrolytic membrane separation (EMS) subsystem because the splitter 428 fails to receive the

reject solution. Therefore, the ion exchanger and the electrodialytic water splitter 428 cannot correspond to the impurity separation subsystem and the EMS, as recited in claim 1.

b) The base depleted regenerant 422 cannot correspond to "a reject solution with an elevated level of the selected impurity"

Appellant notes that the anions combine with hydrogen ions to form acid and that cations form base with hydroxide ions (Byszewski, col. 4, lines 5-13l Figure 1). However, even assuming that the anions and cations correspond to "selected impurities", as recited in claim 1, the ion exchanger simply provides the base depleted regenerant 422, which does not include an elevated level of the selected impurity (i.e., cation). In support of Appellant's position, the operations of the ion exchanger portion illustrated in Figure 5 of Byszewski recites that "the filtered, exhausted anion exchange regenerant is fed into the base purification unit, 409, via line 408.... The recovered base is withdrawn from the base purification unit via line 410. The base depleted exhausted regenerant is removed from the base purification unit via line 412." (Byszewski, col. 7, lines 27-33; Figure 5). *Emphasis Added.*

Accordingly, the ion exchanger produces the base depleted regenerant 422 and supplies this regenerant to the electrodialytic water splitter 428 with the recovered base withdrawn via line 410. Therefore, in contrast with the operations of the impurity separation subsystem, the ion exchanger supplies base depleted exhausted regenerant 422 having a decreased level of the selected impurity, allegedly the cation, rather than an elevated level as delineated in the claim. Hence, Byszewski teaches away from the claimed invention.

In the Final Office Action, the Examiner states that "the Board of Patent Appeals and Interferences… stated a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the structural limitations of the claimed. The device does not undergo a metamorphosis to a new apparatus merely by affixing instructions thereto on the use" (Final Office Action, pages 2-3).

Appellant respectfully submits this statement by the Board does not apply in the present case since the claimed apparatus in Byszewski fails to satisfy "the structural limitations of the claimed" as delineated herein. In other words, Byszewski fails to teach the impurity separation subsystem that produces a reject solution with an elevated level of a selected impurity as claimed because the base depleted exhausted regenerant 422 cannot be interpreted as being the reject solution as recited in claim 1.

c) The recovered base 410 cannot correspond to "the output solution being the feed water having a substantially reduced level of the impurity"

As shown in Figure 5, the ion exchanger portion of the system produces the base depleted exhausted regenerant at line 412 and the recovered base at line 410 (Byszewski, col. 7, lines 27-33; Figure 5).

In contrast, the claim recites "an impurity separation subsystem to remove a selected impurity from a feed water and to produce a reject solution with an elevated level of the selected impurity and an output solution, the output solution being the feed water having a substantially reduced level of the impurity." *Emphasis Added.*

Given that the ion exchanger portion produces (i) the base depleted exhausted regenerant and (ii) the recovered base and the Examiner previously alleged that base depleted exhausted regenerant constitutes the reject solution, the Examiner thus contends that the recovered base corresponds to the output solution. Appellant respectfully disagrees.

The base purification unit 409 receives an aqueous solution, preferably water or a base solution, and the recovered base 410 is withdrawn from the base purification unit. There is no teaching or suggestion that the recovered base is the aqueous solution having a substantially reduced level of impurity, allegedly cations. In fact, since the base purification unit 409 further receives the filtered exhausted anion exchange regenerant 408 and produces the base depleted exhausted regenerant 412, it is likely that the recovered base 410 includes the base that was depleted from the base depleted exhausted regenerant 412. Thus, the recovered base 410 cannot be the aqueous solution 407 having a substantially reduced level of impurity.

Based on the dependency of claims 2-12 on claim 1 believed by Appellant to be in condition for allowance, dependent claims 2-12 are allowable for at least the reasons set forth above. Hence, Appellant respectfully requests that claims 1-12 be allowed.

B. Claims 1-12 Are Not Obvious under 35 U.S.C. §103(a) over Byszewski

With respect to independent claim 13, Byszewski fails to disclose at least "receive a brine solution… having an elevated level of at least one type of impurity" and "produce a resultant brine solution that may be reused for regeneration of an ion exchange resin."

Byszewski merely discloses the electrodialytic water splitter 428, allegedly the EMS, receiving the base depleted regenerant 422. Aqueous solutions, preferably water, dilute or recycled acid or base are fed respectively into the acid and base compartments via lines 423 and

424. The base depleted regenerant solution is split into its acid and base components in the electrodialytic water splitter, 428. The recovered acid is withdrawn via line 429. Base is recovered from electrodialytic water splitter, 428, via line 434. The electrodialytically depleted salt may be withdrawn from the electrodialytic water splitter, 428, via line 433 (Byszewski, col. 7, line 54 to col. 8, line 15; Figure 5).

As discussed above, the base depleted regenerant 422 (1) is pretreated to remove impurities and (2) even assuming that cations are impurities, is base depleted such that base depleted regenerant 422 cannot correspond to the brine solution having an elevated level of at least one type of impurity.

Additionally, assuming that the base depleted regenerant 422 is the brine solution, Byszewski fails to teach or suggest "produce a resultant brine solution that may be reused for regeneration of an ion exchange resin." Instead, electrodialytic water splitter, 428, allegedly the EMS, merely produces an electrodialytically depleted salt, and the recovered acid and base, which allegedly contain the impurities (cations and anions). Given that the base depleted regenerant 422 is assumed to be the brine solution, the electrodialytically depleted salt cannot be the resultant brine solution.

Moreover, the electrodialytically depleted salt is either discarded, or treated to recover excess water (Byszewski, col. 8, lines 15-17; Figure 5). Thus, the electrodialytically depleted salt is not being "reused for regeneration of an ion exchange resin" such that it cannot be resultant brine solution.

Based on the dependency of claims 14-16 on claim 13 believed by Appellant to be in condition for allowance, claims 14-16 are allowable for at least the reasons set forth above.

Hence, Appellant respectfully requests that claims 13-16 be allowed.

C. Claims 17-21 Are Not Obvious under 35 U.S.C. §103(a) over Byszewski in view of Boateng

Similarly, with respect to independent claim 17, Byszewski fails to teach "a brine solution having… an increased level of an impurity."

As discussed above, the base depleted regenerant 422 (1) is pretreated to remove impurities and (2) even assuming that cations are impurities, is base depleted such that base depleted regenerant 422 cannot correspond to the brine solution having an increased level of at least one type of impurity.

Based on the dependency of claims 18-21 on claim 17 believed by Appellant to be in condition for allowance, claims 18-21 are allowable for at least the reasons set forth above.

Hence, Appellant respectfully requests that claims 13-16 be allowed.

D. Improper Rejection

Appellant respectfully submits that this Office Action fails to comply with examination guidelines outlined in MPEP §706 and 37 C.F.R. §1.104(c)(2). More specifically, while the Byszewski reference is clearly a complex reference, the Examiner has again failed to clearly explain or even identify the particular teachings of Byszewski that have been applied against each of the limitations set forth in the rejected claims. In fact, thus far, there has been absolutely no discussion by the Examiner as to what specific teachings within Byszewski constitute the claimed limitations set forth in claims 2-21. Similarly, the Examiner merely states that Boateng discloses the claims 17-21 in Figures 1-4.

Appellant believes that the pending claims are in condition for allowance, and unless the Examiner provides a detailed explanation outlining the presence within Byszewski and Boateng of each of the limitations set forth in the pending claims, Appellant respectfully submits that claims 2-21 are in condition for allowance. Appellant respectfully requests the Board to compel the Examiner to specify those sections in Byszewski that allegedly teach each and every limitation set forth in claims 2-21 or to allow these claims.

VIII. CONCLUSION

Appellant respectfully requests that the Board enter a decision overturning the Examiner's rejections.

Respectfully submitted,

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November 18, 2009

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IX. CLAIM APPENDIX

The claims of the present application which are involved in this appeal are as follows:

1. (Previously Presented) A process system comprising:

an impurity separation subsystem to remove a selected impurity from a feed water and to produce a reject solution with an elevated level of the selected impurity and an output solution, the output solution being the feed water having a substantially reduced level of the impurity; and

an electrolytic membrane separation (EMS) subsystem in fluid communications with the impurity separation subsystem, the EMS subsystem to receive the reject solution from the impurity separation subsystem and an electrically conductive solution, to transfer the selected impurity to the conductive solution.

2. (Original) The process system of claim 1, wherein the EMS subsystem further increases concentration of the reject solution for reuse.

3. (Original) The process system of claim 2, wherein the impurity separation system is an ion exchange unit that comprises ion exchange resin that filter the selected impurity from the feed water.

4. (Original) The process system of claim 3, wherein the reject solution is a brine solution used to regenerate the ion exchange resin.

5. (Original) The process system of claim 2, wherein the reject solution is a diluted brine regenerate solution that achieves an increased concentration through off-gasing.

6. (Original) The process system of claim 1, wherein the EMS subsystem further produces a diluate after removal of the selected impurity from the reject solution and outputs the diluate to a flow including the output solution.

7. (Original) The process system of claim 1, wherein the EMS subsystem comprises

a first cell frame comprises an anolyte compartment to house an anode, the anolyte compartment comprises a first in-flow port and a first out-flow port;

a second cell frame having a catholyte compartment to house a cathode, the catholyte compartment comprises a second in-flow port and a second out-flow port; and

a membrane positioned between the anolyte compartment and the catholyte compartment.

8. (Original) The process system of claim 7, wherein the conductive solution is supplied to the anolyte compartment of the EMS subsystem through the first in-flow port and the reject solution is supplied to the catholyte compartment of the EMS subsystem through the second in-flow port.

9. (Original) The process system of claim 8, wherein the reject solution is a brine solution used to regenerate an ion exchange resin.

10. (Original) The process system of claim 9, wherein the EMS subsystem produces a reusable brine solution after transfer of the selected impurity to the conductive solution for output from the second out-flow port and outputs the conductive solution with the selected impurities via the first out-flow port as waste.

11. (Original) The process system of claim 7, wherein the conductive solution, being negatively conductive, is supplied to the catholyte compartment of the EMS subsystem through the second in-flow port and the reject solution is supplied to the anolyte compartment of the EMS subsystem through the first in-flow port.

12. (Original) The process system of claim 1 further comprising:

a pre-filtration system in fluid communications with the impurity separation system where the feed water is a filtrate being a filtered feed water.

13. (Previously Presented) An electrolytic membrane separation (EMS) subsystem comprising:

a first cell frame comprises an anolyte compartment to house an anode, the anolyte compartment comprises a first in-flow port and a first out-flow port positioned above said first in-flow port;

a second cell frame having a catholyte compartment to house a cathode, the catholyte compartment comprises a second in-flow port and a second out-flow port positioned above said second in-flow port; and

at least one membrane positioned between the anolyte compartment and the catholyte compartment,

wherein the EMS subsystem is adapted to (i) receive a brine solution, used to regenerate an ion exchange resin and having an elevated level of at least one type of impurity, into one compartment of the anolyte and catholyte compartments, (ii) receive a conductive solution having a volume substantially less than a volume of the brine solution into a different compartment than the compartment supplied with the brine solution, (iii) remove the at least one type of impurity from the brine solution, and (iv) produce a resultant_brine solution that may be reused for regeneration of an ion exchange resin.

14. (Original) The EMS subsystem of claim 13 further producing a waste solution including the conductive solution having at least one type of impurity.

15. (Original) The EMS subsystem of claim 13, wherein the catholyte compartment to receive the brine solution and the anolyte compartment to receive the conductive solution.

16. (Original) The method of claim 13, wherein the anolyte compartment to receive the brine solution and the catholyte compartment to receive the conductive solution being negatively charged.

17. (Previously Presented) A method comprising:

providing an electrolytic membrane separation (EMS) subsystem that comprises a plurality of compartments each including an electrode being one or an anode and a cathode;

supplying a brine solution having a first volume and an increased level of an impurity to a first compartment of the plurality of compartments;

supplying a conductive solution to a second compartment of the plurality of compartments, the conductive solution having a second volume substantially less than the first volume;

energizing the electrodes to cause ions associated with the impurity to migrate from the brine solution to the second compartment; and

outputting the conductive solution having the impurity as waste.

18. (Original) The method of claim 17 further comprising:

outputting a resultant brine solution for reuse in regenerating ion exchange resins.

19. (Original) The method of claim 18 further comprising:

off-gasing the brine solution as the impurity has been removed to produce the resultant brine solution.

20. (Original) The method of claim 17, wherein the impurity comprises one of a monovalent ion and a heavy metal.

21. (Original) The method of claim 17, wherein the impurity comprises one of a monovalent ion and a heavy metal.

X. EVIDENCE APPENDIX

None

XI. RELATED PROCEEDINGS APPENDIX

None